

IT BASED INTEGRATION BUSINESS PROCESSES

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Abstract: Peer-to-Peer (P2P) computing represents the next revolution in the computing age. Web Services standardization will provide the means for P2P architecture to be broadly adopted by companies for enterprise and business-to-business application integration.

Keywords: Peer- to- peer technology; business processes; applications.

1. Introduction

In the context of integrating distributed business application systems, the vision of redundancy and robustness was not resumed consequently: A changing business environment results in new technical developments and increasing demand of IT supported execution of business processes.

A first naive solution to provide an interaction of different systems is shown in figure 1. This connection of resources is not able to be maintained properly, as it contains too many non-standardized interfaces.

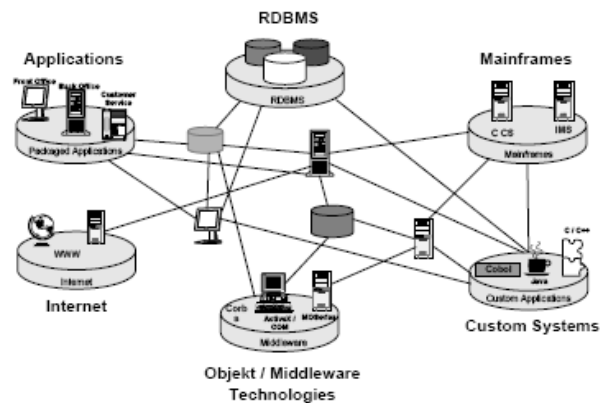


Fig. 1. Heterogeneous IT-Infrastructure

2. Enterprise Application Integration

In time, most enterprises recognized that there has to be found another solution for a reliable integration of business applications. the efforts of bringing together single systems to one logical unit are paraphrased with the term *Enterprise*

Application Integration (EAI). EAI¹ enables data propagation and business process execution throughout the numerous distinct networked applications as if it would be a unique global application. It is a distributed transactional approach and its focus is to support operational business functions such as taking an order, generating an invoice, and shipping a product.

EAI means a bold venture, as the interaction of business applications is restricted due to several constraints:

- *different communication protocols* and interfaces,
- *syntactical differences* between data of the single applications
- *proprietary semantic* of particular system messages, and finally
- Business modelling methodology differs from the technical implementation.

Certain applications based on P2P technology are already in use for non-commercial purposes. A prominent example is the exchange of music, movies and software via file-sharing networks where single peers communicate directly without detouring via any central servers. All the same, some crucial advantages of P2P technology (performance, resilience, loadbalancing, etc.) are well-known to many software architects.

A peer-to-peer (or P2P) computer network is a network that relies primarily on the computing power and bandwidth of the participants in the network rather than concentrating it in a relatively low number of servers. P2P networks are typically used for connecting nodes via largely *ad hoc* connections. Such networks are useful for many purposes. Sharing content files containing audio, video, data or anything in digital format is very common, and realtime data, such as telephony traffic, is also passed using P2P technology.

The Gartner Group² defines P2P computing as: "characterized by direct connections using virtual namespaces, it describes a set of computing nodes that treat each other as equals (peers) and supply processing power, content or applications to other nodes in a distributed manner, with no presumptions about a hierarchy of control".

Enterprise Application Integration (EAI) is a natural next step in corporate information technology (IT) development³. Companies have over a number of years created a complex web of interconnected applications each with its own means of communicating with other systems. As new systems are introduced, they too must be interfaced with each of these legacy applications, making every step more difficult to perform and more costly. These point-to-point (P2P) solutions often lead to an inability to capture network events and create problems of untraceable revenue leakage and loss or inconsistency of data.

¹ www.informatica.com/solutions/resource_center/glossary/default.htm

² www.gartner.com

³ <http://www.atosorigin.com>

A pure peer-to-peer network does not have the notion of clients or servers, but only equal *peer* nodes that simultaneously function as both "clients" and "servers" to the other nodes on the network. This model of network arrangement differs from the client-server model where communication is usually to and from a central server. A typical example for a non peer-to-peer file transfer is an FTP server where the client and server programs are quite distinct, and the clients initiate the download/uploads and the servers react to and satisfy these requests.

The concept of peer to peer is increasingly evolving to an expanded usage as the relational dynamic active in distributed networks, i.e. not just computer to computer, but human to human. Yochai Benkler⁴ has developed the notion of commons-based peer production to denote collaborative projects such as free software.

An important advantage in peer-to-peer networks is that all clients provide resources, including bandwidth, storage space, and computing power. Thus, as nodes arrive and demand on the system increases, the total capacity of the system also increases. This is not true of a client-server architecture with a fixed set of servers, in which adding more clients could mean slower data transfer for all users.

The distributed nature of peer-to-peer networks also increases robustness in case of failures by replicating data over multiple peers, and -- in pure P2P systems -- by enabling peers to find the data without relying on a centralized index server. In the latter case, there is no single point of failure in the system.

When the term peer-to-peer was used to describe the Napster network, it implied that the peer protocol was important, but, in reality, the great achievement of Napster was the empowerment of the peers (i.e., the fringes of the network) in association with a central index, which made it fast and efficient to locate available content. The peer protocol was just a common way to achieve this.

P2P means a networked structure where the participants interact and share resources directly and equitably, "sharing of computer resources and services by direct exchange between systems". In contrast to client/server architectures, P2P networks do not include any kind of hierarchical structure. In the following, the term peer describes a participant within a P2P network.

In principle, single peers are independent from certain hardware platforms. This comprises a wide range of supposable systems, ranging from PDAs via desktop computers up to mainframes. They are all characterized by the following properties:

- autonomy
- direct exchange
- client and server functionality

⁴ Benkler's research focuses on commons-based approaches to managing resources in networked environments. He coined the term commons-based peer production to describe collaborative efforts, such as free and open source software and Wikipedia which are based on sharing of information.)

Autonomy is in charge of each single peer at which time it provides which service, data or output to the network. Direct exchange. There is no central coordinating instance controlling the communication between the peers. Client and server functionality: Every peer is able to receive data from other peers as well as to provide data for others.

Using EAI tools and techniques a complete EAI solution tackles and improves:

- inefficiency of disparate data sources
- inflexibility of packaged solutions
- complexity of modern IT infrastructure and architectures
- high cost of developing and supporting P2P solutions

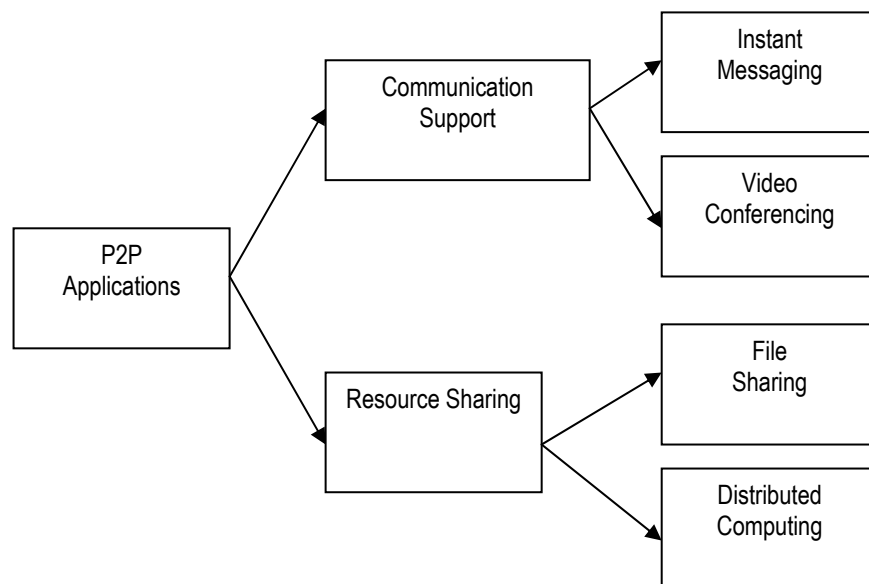


Fig. 2. Typical P2P⁵ applications

Communication support is the most common kind of applications for P2P networks within enterprises. These applications are characterized by an open and highly dynamic number of participants.

⁵interop-esa05.unige.ch/INTEROP/Proceedings/Interop-ESAScientific/PerPaper/I09-1%20404.pdf

Instant messaging applications are a form of real-time communication between two or more people based on typed text. The text is conveyed via computers connected over a network.

Video conferencing. A videoconference (also known as a *videoteleconference*) is a set of interactive telecommunication technologies which allow two or more locations to interact via two-way video and audio transmissions simultaneously. It has also been called visual collaboration and is a type of groupware.

Resource sharing. P2P can use the unused resources and hereby achieve a drastic cost reduction, combined with other competitive advantages.

File sharing provides shared access to any files that are stored by any peer.

Distributed computing is decentralised and parallel computing, using two or more computers communicating over a network to accomplish a common objective or task. The types of hardware, programming languages, operating systems and other resources may vary drastically. It is similar to computer clustering with the main difference being a wide geographic dispersion of the resources

Assigning the peer-to-peer paradigm to the context of business integration means that all systems and components of an enterprise work in a self-organizing manner. Using P2P for integration, administration and integration costs can be reduced. Others advantages are:

- Better reliability. Because is not a client server architecture, when a peer breaks, another can replace it.
- A non-central topology. Every peer offers at least one service and several others peers may contain the same services.
- Scalable performance. The performance of the network depends of the number of peers, so is almost unlimited.
- Easy configuration. Every peer only contains the business knowledge it requires to accomplish its functionality. The configuration of the complete architecture results from the sum of the configuration of the single peers.

3. Conclusions

Peer-to-peer computing based architecture allows for decentralized application design, moving from centralized server models to a distributed model where each peer, independent of software and hardware platforms, can benefit and profit from being connected to millions of other peers. In such architectures, clients and servers have a lateral relationship rather than the traditional vertical relationship, giving the whole peer group tremendous processing power and storage space.

It is worth mentioning that P2P computing is still in an evolving state and much needs to be done to overcome complex issues such as security, network bandwidth, and architecture designs.

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interop-esa05.unige.ch/INTEROP/Proceedings/Interop-ESAScientific/PerPaper/I09-1%20404.pdf
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Note: This paper has been presented to the *International Conference on Business Excellence*, 27-28 October, 2006, Braşov, Romania.